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OBSERVATIONS ON SOME AUSTRALIAN FOREST INSECTS

22. Notes on Some Australian Leaf-miners

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(Text figures 1-36)

SYNOPSIS

Information concerning Australian leaf-miners is limited, and in this paper some leaf-mining species of Coleoptera, Hymenoptera, Diptera and Lepidoptera bred from various host plants are recorded.

Although the extent of the biological studies of each species was necessarily restricted, the observations recorded add to the knowledge of the various groups of leaf-miners commonly encountered during forest entomological investigations in New South Wales.

INTRODUCTION

Forest trees, amenity trees and shrubs, or agricultural plants, at times may be severely attacked by leaf-miners, and the importance of damage caused by these insects may be classified broadly as either economic or aesthetic.

Comparatively few Australian leaf-miners are of economic importance, although a number of species associated with agriculture at times destroy or severely affect crops of potential food value to man, or to those animals on which man is dependent.

As most leaf-miners are minute insects, the effects of damage to trees and shrubs are usually insignificant unless large numbers of a particular leaf-miner species occur at the one time, when defoliation of trees over hundreds or thousands of acres of forest may occur (Moore 1963; Newman & Clark 1945) or when amenity plantings are severely affected (Hadlington 1954).

The number of species of these small or minute insects which feed within the tissues of leaves, is considerable, and most species belong to the order Lepidoptera (moths), although a few belong to the orders Coleoptera (beetles), Diptera (flies) and Hymenoptera (sawflies). They are called "leaf-miners" because they feed on, and mine between, the leaf tissues situated between the upper and lower leaf cuticles.

Some intensive studies of leaf-miners have been made in Europe (Hering 1951), America (Needham, Frost & Tothill 1928) and New Zealand (Watt 1924). This paper collates information on the biology, and illustrates some of the mines, of about 120 species indigenous to Australia, and refers to literature concerning introduced species.

LEPIDOPTEROUS LEAF-MINERS.

Evidence that lepidopterous leaf-miners occurred some 40 million years ago is recorded by Freeman (1965). Some species of lepidopterous leaf-miners complete their life-cycle within a few weeks, while others may produce only one generation each year. Eggs may be deposited either on the outside of the leaf cuticle or within the tissues below either the upper or the lower leaf cuticle. A particular oviposition site may be constant for a given family

or genus of moths. The type of leaf tissue in which larvae at times may feed and mine is sometimes associated with a discrete speices of leaf-miner or even a particular larval instar, and the shape of some mines may be typical for a certain genus, or species, of insect. Larvae may commence feeding in the epidermal cells immediately below either the upper or lower leaf cuticle and/or the palisade parenchyma; others may feed on the spongy parenchyma, or consume one or more cell layers. Others migrate internally from one side of the leaf to the other side, destroying only the epidermis in their early instars, and the upper or lower parenchyma during later instars; some destroy all of the parenchymous tissue, so that only the upper and lower leaf cuticles remain above and below the mine.

Leaf-mining larvae are comparatively soft and are relatively secluded in an area where they are surrounded by sappy plant tissues. During their early instars they are usually found in the young tender leaves of new plant growth, although leaves sometimes become fully developed before the larval stages are completed. Larvae of early sap-feeding instars usually possess mouthparts specialised for abrading the leaf cell walls (Moore 1953) to release the plant fluids necessary for their growth, but chewing mouthparts are typical of later instar larvae when the leaf tissues are ingested and the mine is considerably extended and deepened. Larvae may pupate either within the mine, or in cocoons spun on twigs or leaves, among debris on or near the ground, or in the soil.

A number of lepidopterous leaf-mining species construct typical mines differing in detail from those of all other species. The great diversity of mine patterns and sizes is of particular interest, and sometimes is of value in the determination of the insect species. Host association also appears to be of importance to some species.

Parasitism of leaf-miners usually occurs, varying considerably in the one locality and sometimes causing complete mortality for a given species. Braconid and chalcidoid wasps are the parasites most often reared from leaf-miners, and ants and small birds appear to be the principal predators.

Mines may be classified broadly as:—

Blotch:	These mines, usually about as wide as they are long, appear as blisters on the leaf surface (Figure 4).
Linear:	Larvae mine more or less directly forward (Figure 22).
Linear-blotch:	Construction of the linear portion precedes that of the blotch portion (Figure 2).
Serpentine:	This type of mine is long, narrow and sinuous, and of comparatively uniform width (Figure 14).
Serpentine-blotch:	The serpentine portion is usually constructed by an early instar larva, and the blotch portion by later instars (Figure 12).
Linear-expanded:	Mines are at first linear, then expanded distally into a small blotch-like area during the last instar (Figure 13).
Serpentine-expanded:	As the previous type, except that the early portion is serpentine (Figure 8).
Digitate:	As the name suggests, mines are constructed in various directions with the narrow prolongations appearing finger-like (Figure 1).

A. Family Gracilariidae.

Mines constructed by species in this family appear to be of similar general type and shape within each discrete genus, although they may differ considerably between genera.

Mines of the various species in the genus *Acrocercops* are similar in general appearance, and usually show characteristics distinct from those of other genera in this family. Early instar larvae usually construct a narrow, more or less linear type mine, although this portion of the mine is often obliterated during later instars as the blotch is constructed in the same general area of the leaf.

Acrocercops calicella (Stainton).

Mine type: Digitate-blotch (Figure 1).

Host: *Eucalyptus acmenioides* Schau.

Locality: Lisarow, N.S.Wales.

Notes: Oviposition usually occurs on the upper leaf surface and the early stage of the mine is constructed in the epidermal cells beneath the upper cuticle. Larvae are similar in shape and habits to those of *A. hoplocala*. The early instar larvae are sap-feeding and later instar larvae deepen the mine as most of the palisade and spongy parenchyma are destroyed. The mines are usually narrower and longer than those of *A. hoplocala*, and with the perimeter sinuate or digitate.

Larvae emerge from the mines to pupate either on their outer surfaces or along the leaf edge, when reared in jars. The cuticle of the mine is at first silvery white, but later becomes more darkly stained with brown than the mine of *A. hoplocala*. Granular excreta are distributed along the perimeter of the mine.

The cocoons, golden in colour, are spun in positions similar to those of *A. hoplocala* when held in jars. No globules have been found on or in the cocoons of this species.

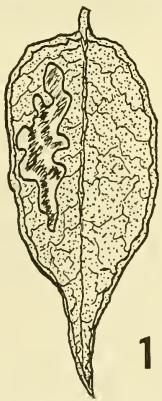

Figure 1. Mine of *Acrocercops calicella* on *Eucalyptus acmenioides*.

Acrocercops chionosema Turner.

Mine type: Linear-blotch.

Host: *Macadamia integrifolia* Maiden & Betche.

Locality: Sydney to Queensland.

Notes: This species is referred to by Cann (1965) as mining in the upper surface of the leaves of the Queensland nut tree.

Mines occur on *M. integrifolia* during spring and autumn at Sydney. They may be up to 60 mm. in length, with the blotch portion always across and along the centre vein of a leaf. The blotch area has markings of a rusty red-brown colour caused by the lines of excreta within the mine. Last instar larvae deepen the mine, and affected leaves bear patches of brown where tissues have died beyond the mine.

Acrocercops hoplocala Meyrick.

Mine type: Linear-blotch (Figure 2).

Host: *Eucalyptus saligna* Smith.

Localities: Sydney; Gosford-Wyong area, N.S.Wales.

Notes: Larvae have been collected during March, May to September, and November to January.

Oviposition always occurs on the upper leaf surface, and the egg is visible as a silvery spot at the commencement of the linear portion of the mine, or on the blotch portion when it has obliterated the commencement of the linear portion.

The larva mines directly into the leaf tissues through the base of the egg attached to the cuticle. The upper epidermis is destroyed during early instars when the linear portion of the mine is constructed.

Both the linear and the blotch portions are white, but pale brown staining from the excreta of the early sap-feeding instar larva is sometimes evident. Larvae are similar in appearance to those of *A. laciniella,* with typical prognathous

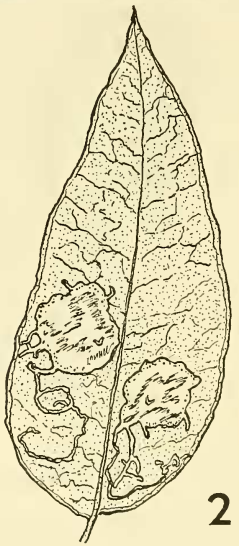

Figure 2. Mine of *Acrocercops hoplocala* on *Eucalyptus saligna.*

sap-feeding mouthparts during early instars, but with the more usual lepidopterous mouthparts as the blotch area is constructed during later instars when portions of the blotch are irregularly deepened and most of the palisade and spongy parenchyma is destroyed.

The linear portion of the mine is completed in about 10 to 14 days, and the blotch portion in a further 6 to 8 days. The larva emerges from the mine through a semi-circular slit cut in the upper cuticle, and pupates in a white to pale yellow cocoon which may be attached to the leaf or the blotch mine cuticle when specimens are reared in jars. No globules have been found attached to cocoons of this species although they usually occur on or in the cocoons of some other species of the family Gracilariidae.

A single mine usually occurs in almost any position on the upper leaf surface, but occasionally two mines may be present. The blotch sometimes may be extended so that, when completed, only small lengths of the linear portion are visible, but more usually, most of the linear portion remains. The pellets of excreta voided by the later instar larva are distributed in a broken line around the perimeter of the mine. A purplish discoloration is usually present in the leaf tissues outside the perimeter of the mine on the upper surface of the leaf, while a slight purplish suffusion on the lower surface is often the only indication of the presence of the mine above.

During early spring, the time occupied from eclosion to pupation is about 3 weeks, adults emerging about 3 weeks later.

Larvae of the Braconini (Braconidae) are ectoparasitic on larvae of *A. hoplocala*, and they construct silken cases near the centre of the mine in which to pupate, and which are surrounded by a thin black line of lepidoptera pellets.

Acrocercops laciniella (Meyrick).

Mine type: Linear-blotch.

Hosts: *Angophora costata* (Gaertn.) Druce; *A. floribunda* (Smith) Sweet; *Eucalyptus pilularis* Smith; *E. saligna; E. acmenioides.*

Localities: Sydney; Lisarow; Gosford; Norah Head; Olney East State Forest, N.S.Wales.

Some biology of this species, with figures of mines and details of larvae, have been recorded previously (Moore 1963).

Acrocercops macaria Turner.

Mine type: Blotch (Figure 3).

Host: *Euodia micrococca* F. Muell.

Locality: Ourimbah State Forest, N.S.Wales.

Notes: Larvae have been collected during September. During early larval instars the mines are shallow, but they are deepened during later instars, so that only the upper and lower cuticles of the leaf remain covering the mined area. The lower cuticle of the mine is at first white, later becoming suffused with pink. Excreta are distributed randomly throughout the mine.

Mines are comparatively small (about 8 mm. long and 5 mm. wide), always occur below the hairy undersurface of the leaves, and are usually bounded by the mid-vein, the edge of the leaf near its base, and two adjacent secondary veins, although some mines occur further along the leaf toward the tip.

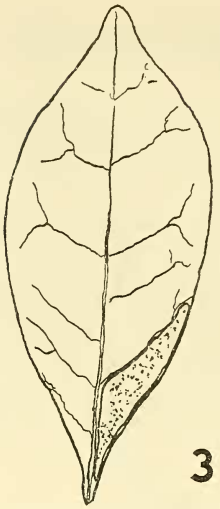

Figure 3. Mine of *Acrocercops macaria* on *Euodia micrococca.*

Larvae are at first cream, becoming increasingly suffused pinkish orange, and when about to pupate are pink with reddish transverse markings. They emerge from the mine through a crescentic slit cut in the cuticle, usually at the distal end of the mine, to pupate in silken cocoons constructed on the leaf surface when held in jars.

The pupal exuviae is protruded from the cocoon before the adult emerges. Adults emerged during October.

Acrocercops ordinatella (Meyrick).

Adults of this species were reared from larvae collected near Coff's Harbour, N.S.Wales, during February, mining in the leaves of a one-year-old plant of *Cinnamomum camphora* (L.) Nees. Adult moths emerged during February.

Acrocercops plebeia (Turner).

Mine type: Linear-blotch.

Host: *Acacia podalyriifolia* A. Cunn. ex G. Don.

Locality: N.S.W. and Queensland.

Notes: This species on the above host, and some of its biology, is recorded by Froggatt (1927).

Mines may occur on both sides of the leaves and cover most of the leaf surfaces, so that little of the linear portion of the mine is eventually discernible.

Larvae collected during 16 February at Sydney, emerged as adults on 3 March. Larvae constructed their deep cream cocoons on the base of the rearing jar

Acrocercops sp. near *argyrodesma* (Meyrick).
Mine type: Linear-blotch.
Host: *Hakea salicifolia* (Vent.) B. L. Burtt.
Locality: Ourimbah State Forest, N.S.Wales.
Notes: Foliage of the attacked shoots becomes brown and distorted, with the death of some shoots occurring distally.

From larvae collected and reared during November and December, adults emerged during December and January. The life cycle occupied about 5 weeks.

Acrocercops sp. nov. ? (in *laciniella* group)
Mine type: Blotch.
Host: *Eucalyptus radiata* Sieb.
Locality: Kanangra Walls, N.S.Wales.
Notes: Larvae collected during August spun their golden-brown cocoons on the cuticles of the mines when reared in jars, and adults emerged during October.

The blotch mine is round to oval, white, and without brown staining, and as many as 3 mines may occur on the one leaf. The linear portion is usually obliterated by the blotch portion which may cross the mid-vein of the leaf.

Acrocercops sp.
Mine type: Blotch (Figure 4).
Host: *Asterolasia correifolia* Benth.
Locality: Ourimbah State Forest, N.S.Wales.
Notes: Several somewhat tortuous, silvery linear type mines in the upper epidermis of a leaf sometimes radiate from the one centre of oviposition. All the parenchyma is consumed as the blotch area is completed, so that most, if not all, of the linear portion is obliterated by the blotch portion. The mines always spread each side of the mid vein.

Larvae leave the mine through a crescentic shaped slit in the cuticle of the upper leaf surface, to pupate on the leaf or on the cuticle of the mine when reared in jars. Numerous globules may occur on the cocoon, and the pupal exuviae is protruded from the cocoon before the adult emerges.

Figure 4. Mine of *Acrocercops* sp. on *Asterolasia correifolia*.

Pupation occupied about 2 to 3 weeks during October, and adults emerged during October and November.

Braconid wasps were reared from larvae of this species.

Acrocercops sp.

Mine type: Linear-blotch.

Host: *Pomaderris ligustrina* Sieb. ex DC.

Locality: Lisarow, N.S.Wales.

The biology of this species is very similar to that of the previously mentioned species, but the mines do not always spread each side of the mid-vein.

Gracilaria xanthopharella Meyrick.

Mine type: Linear-expanded (Figure 5).

Host: *Glochidion ferdinandi* J. Muell.

Locality: Gosford area, N.S.Wales.

Notes: The mine of this species of *Gracilaria* has characteristics distinct from those of the species studied in other genera of the family Gracilariidae. It is at first white and tortuous, with the latter half of the completed mine pale brown, and more or less extending into a blotch at its distal end. Cocoons are spun on the leaf or on the container used for rearing the specimens. Larvae were collected during August and September.

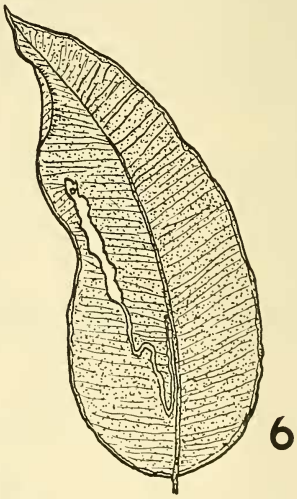

Figure 5. Mine of *Gracilaria xanthopharella* on *Glochidion ferdinandi*.

Figure 6. Leaf of *Aneophora floribunda* showing mine and pupation site of *Parectopa ida*.

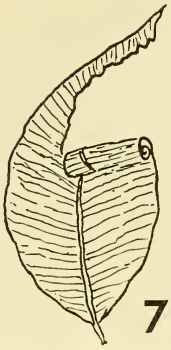

Figure 7. Leaf curled by larva of *Parectopa ida*.

Parectopa ida (Meyrick).

Mine type: Linear-expanded (Figures 6 and 7).

Hosts: *Angophora floribunda; Eucalyptus acmenioides; E. gummifera* (Gaertn.) Hochr.; *E. paniculata* Smith; *E. pilularis; E. robusta* Smith; *E. saligna.*

Localities: Sydney; Gosford-Wyong area; Norahville, N.S.Wales.

Notes: The mines and habits of *P. ida* are distinct from those of the species studied in the other genera of this family.

In the Lisarow area, the host most heavily attacked was *A. floribunda,* and larvae were collected during the months of March and May to November.

Oviposition occurs only on the lower surface of a leaf, the egg being placed on the external leaf cuticle. After emergence of the larva, the more or less oval chorion, about 0.6 mm. in diameter, is visible as a minute silvery spot on the leaf surface at the commencement of the mine.

Larvae emerge through that portion of the chorion attached to the leaf cuticle, and so commence mining in the leaf tissues, thus obviating their exposure on the leaf surface. Mines usually occur only in the comparatively young and succulent leaves of epicormic, coppice and regeneration growth of the various host plants.

During the first instar, when larvae do not possess the more usual lepidopterous mandibles, only the epidermal layer of cells is destroyed. The mandibles are flat, plate-like structures with rounded and serrated anterior edges utilised for cutting and bruising the cells to release the fluids which are conveyed along grooves on their surfaces. The head capsule is extremely flattened dorso-ventrally, with prognathous mouthparts. Both types of mandibles, which have been figured previously (Moore 1963), are similar to those of *A. laciniella.* Larvae are thus peculiarly adapted to mine proficiently in a very restricted area. The head capsule is protrusible anteriorly.

For about 11 days after eclosion, the larva mines forward to form a narrow linear mine through the epidermal cells with only the thin cuticle of the leaf remaining above it. The mine is visible as a silvery-white line which

is variable in length and position on the leaf. The linear portion of the mine may extend for about 50 mm. to 60 mm., and gradually increases in width from the diameter of the egg to more than 1 mm. where it adjoins the expanded area.

On completion of the linear portion, the larva undergoes ecdysis, when its mouthparts become the more usual lepidopterous type. For about 3 days after the larva recommences to feed, it continues to mine forward, but the resulting mine now becomes wider and deeper, assuming the form of an elongate expanded area about 20 mm. long and 2.5 mm. wide. This area becomes tan-brown in colour soon after the tissues are destroyed. On the upper leaf surface opposite to the mine, is an elongate pale green or yellow-green to red-brown area corresponding more or less to the shape of the mine below. As the expanded portion is extended, the palisade and portion of the spongy mesophyll of the leaf are destroyed, and a fine web spun over the internal upper surface of the mine causes the thin "roof" of the mine to be raised for all of its length into a gable-shaped ridge over the larva. When the young leaf is actively growing, or when the mine is close to its outer edge, distortion of the leaf occurs in that area. The larva then commences to deepen the expanded area by consuming the remaining parenchyma. This may occupy about 6 days, with a total of 9 to 11 days from the commencement of the expanded area. Last instar larvae are pale yellow and about 8 mm. to 9 mm. in length.

After the deepening of the expanded area, the larva emerges through a round hole cut in the ridged cuticle near the end of that area. From the mine, it moves to the leaf tip where it spins thick strands of silk which adhere to the surface of the leaf. The tip of the leaf is thus curled approximately twice, into a tube-like structure in which the larva continues to feed on the ventral surface of the leaf forming the tube. The leaf may also be cut by the larva, longitudinally from the tip, with the cut forming one extremity of the tube and the leaf edge the other extremity (Figure 7). Should leaves be in contact, larvae may tie them together with silken threads and feed within that area, instead of constructing the tube.

Mines may occur almost anywhere on the lower surface of a leaf, and the linear portion may cross the mid-vein, usually toward the distal end of the leaf. The excreta of larvae during the early sap-feeding instars is visible as a faint brownish stain on the cuticle, usually along the centre of the silvery-white portion. When the larva attains its more typical lepidopterous mouthparts and commences to ingest the tissues with the sap, the excreta become granular and loose in the expanded area of the mine. The linear portion of the mine is constructed by the first two larval instars, the remaining two instars constructing the expanded area and curling the leaf.

When about to pupate, the larva leaves the tube and proceeds to the edge of a leaf (not necessarily the one it has curled) where, by means of a strong web of silk, a small portion of the edge becomes folded over to form a shelter where the larva spins its cocoon of shiny white silk (Figure 6). Attached to the internal or external surface of many of the cocoons is a variable number of minute globules composed of a shiny white substance. From eclosion of the larva to pupation is about 3 weeks.

The pupa fractures the cocoon by means of a series of spinous processes on the anterior tip of the exuviae and which are similar to those on the pupa of *A. laciniella* (Moore 1963, Fig. 5). The exuviae protrudes for about two-thirds of its length from the end of the cocoon prior to the moth emerging, about 3 to 6 weeks after the construction of the cocoon.

The adult moth, with a wing span of about 11 mm. and a length of 4 mm. is prominently marked with red, yellow, black and white.

The life cycle from the egg to the adult occupies about 6 to 9 weeks, early instar larvae collected during July emerging as adults during August and September.

Wasps of the Chalcidoidea and Ichneumonidae have been reared from specimens collected at Lisarow, N.S.Wales.

Phyllocnistis diaugella Meyrick.

Mine type: Serpentine (Figure 8).

Host: *Breynia oblongifolia* J. Muell.

Locality: Lisarow-Wyong area, N.S.Wales.

Notes: Mines of species in this genus have characteristics distinct from those in other genera of this family. All of those mines examined were situated on the upper surface of the leaves, and the white silvery cuticle of the mine was stained with a narrow pale to dark brown sinuate mark caused by the larval excreta. A mine of this species occupies most, or all, of the upper leaf surface.

Larvae were collected during September, and pupation occupied about 16 days during that month.

Figure 8. Mine of *Phyllocnistis diaugella* on *Breynia oblongifolia*.

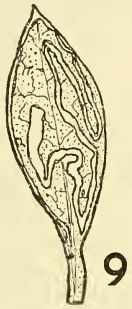

Figure 9. Mine of *Phyllocnistis* sp. on *Hibbertia scandens*.

Phyllocnistis sp. (probably sp. nov.)

Mine type: Linear-expanded (Figure 9).

Host: *Hibbertia scandens* (Willd.) Gilg.

Locality: Lisarow, N.S.Wales.

Notes: Larvae at first construct an extensive linear type mine in the lower parenchyma, then migrate internally to the upper palisade layer alongside the mid-vein near the base of the leaf, to complete their mines. Mines are visible as a pale pinkish linear marking on the lower surface, and a reddish-brown serpentine area more or less conforming to the shape of the mine, on the upper surface. Mines are similar to, but usually larger than, those of *P. diaugella*.

The excreta, which are deposited in a sinuate line transversely, stain the mine cuticle dark brown, similar to mines of *P. diaugella*. The leaf is drawn into a crease or fold along the distal portion of the mine where the cocoon is constructed, and where the larva pupates.

Larvae were collected during September and February.

Pupation occupies about 12 days during September, and the pupal exuviae is protruded from the extremity of the mine as the adult emerges.

B. Family Nepticulidae.

The mines of the various species in this family of moths are more readily separable than are those of species in the family Gracilariidae, and it appears that most species may be determined by the structural differences shown in the mines. The species of leaf-miners occurring in this family are among the smallest moths known, and adults are usually dark coloured, sometimes with a metallic suffusion and a few white scales.

Nepticula phyllanthina Meyrick.

Mine type: Serpentine-linear-expanded (Figure 10).

Host: *Glochidion ferdinandi.*

Locality: Sydney; Lisarow, N.S.Wales.

Notes: Oviposition occurs on the under surface of a leaf, usually close to the leaf edge, the larva entering the leaf through the chorion to commence mining below the upper cuticle. When the mine is completed, larvae cut an oval hole in the distal extremity of the mine on the lower leaf surface and fall to the ground where a minute white cocoon is constructed in the soil.

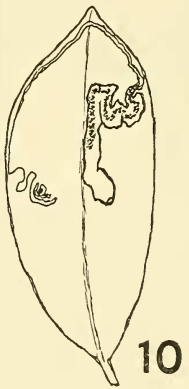

Figure 10. Mine of *Nepticula phyllanthina* on *Glochidion ferdinandi.*

Larvae were collected during August, pupation occupying about 4 weeks during spring, and the pupal exuviae is protruded from the end of the cocoon before the adult moth emerges.

Nepticula ? funeralis Meyrick.

Mine type: Serpentine-blotch (Figure 11).

Hosts: *E. acmenioides; E. pilularis.*

Locality: Lisarow, N.S.Wales.

Notes: Oviposition occurs anywhere on the upper leaf surface, and larvae commence mining beneath the upper cuticle. The egg may be seen as a brown shiny speck on the leaf.

Figure 11. Mine of *Nepticula ? funeralis* on *Eucalyptus acmenioides.*

The mine appears as a dark brown blotch on the upper leaf surface, while on the lower leaf surface a brown area denotes its position. It is at first serpentine for a comparatively short distance, then enlarges to form a blotch, which is often restricted by the venation of the leaf. Larvae cut through the upper cuticle at the distal end of the mine, and fall to the ground where they pupate. Larvae leaving mines during July emerge as adults during the following March.

Larvae are pale green, with a dark median stripe which is due to the presence of recently ingested leaf tissues in the alimentary tract.

Nepticula sp. (in *funeralis* ? group).
Mine type: Serpentine-blotch (Figure 12).
Hosts: *E. saligna; E. grandis; E. microcorys* F. Muell.
Locality: Lisarow; Ourimbah State Forest, N.S.Wales.
Notes: Oviposition occurs on the upper leaf surface. On leaving the mine, larvae make an oval hole in the lower leaf cuticle, fall to the ground and pupate in small golden-coloured cocoons under debris on the ground.

Position of the mine on the leaf is variable, but it usually occurs near the mid-vein. The early portion is serpentine, with the blotch area superimposed and extended laterally. Excreta are compacted along that side of the mine nearest to the mid-vein.

Larvae collected during July emerged as adults during the following March.

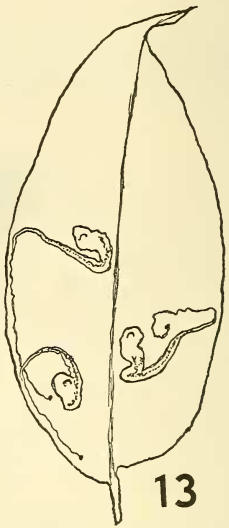

Figure 12. Mine of *Nepticula* sp. on *Eucalyptus saligna.*
Figure 13. Mine of *Nepticula* sp. No. 1 on *Eucalyptus saligna.*

Nepticula sp. No. 1 (near *libera*).
Mine type: Linear-expanded (Figure 13).
Hosts: *E. saligna; E. acmenioides; E. grandis; A. floribunda.*
Localities: Lisarow; Pennant Hills, N.S.Wales.
Notes: Oviposition and the mines occur on the upper leaf surface, up to 3 mines occurring on the one leaf. Larvae leave the mines at dusk through a crescentic slit made in the upper leaf cuticle at the distal end of the mine. Larvae have been collected during May to December, those collected during

the first week in July emerging as adults approximately 7 to 8 weeks later, and those larvae which emerge from the mines during May, become adults during July. Last instar larvae are orange with the digestive tract green.

The mine is reddish-purple proximally, then reddish-pink to the expanded portion from where it is cream-fawn in colour. Excreta may be seen through the leaf cuticle as dark areas in the first portion of the mine, and later fill the early part of the expanded portion. As the mine is expanded, the black excreta appear at the side of the mine, and the line is forked distally near where the larva emerges.

Pupation occurred in the soil when held in jars, and the pupal exuviae protruded from the soil as the adults emerged.

Nepticula sp. No. 2 (near *funeralis* or *melanotis*).

Mine type: Serpentine (Figure 14).

Hosts: *E. saligna; E. acmenioides; E. pilularis; A. floribunda.*

Locality: Lisarow, N.S.Wales.

Notes: Eggs are placed on the upper leaf surface. Unlike the previous species, larvae leave the mine through a semi-circular slit made in the ventral leaf cuticle. Larvae collected during September pupated and emerged as adults about 6 weeks later. Some collected during July emerged during August. Last instar larvae are bright green in colour. After leaving the mine, larvae spin a flattened tan-brown cocoon on debris or just below the soil surface, the pupal exuviae being protruded from the end of the cocoon when the adult emerges.

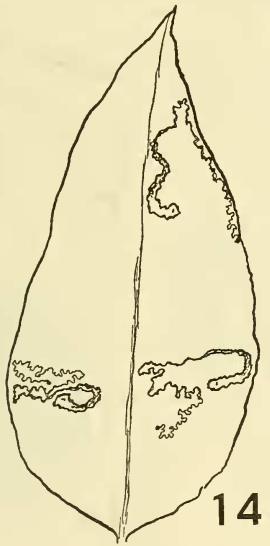

Figure 14. Mine of *Nepticula* sp. No. 2 on *Eucalyptus saligna.*

Mines occur on the upper surface of a leaf, but their position is variable on the leaf. The proximal portion of the mine is filled with excreta which appear red-brown on the upper leaf cuticle, while excreta in the distal portion are black, and placed centrally in the mine. There is a minute red area where the egg is deposited on the leaf surface. During early instars, a silvery-white, tortuous linear mine is constructed, and during the later instars the mine appears creamy white with a central line of excreta appearing black on the cuticle.

Five specimens of a chalcidoid parasite emerged from one mine during August.

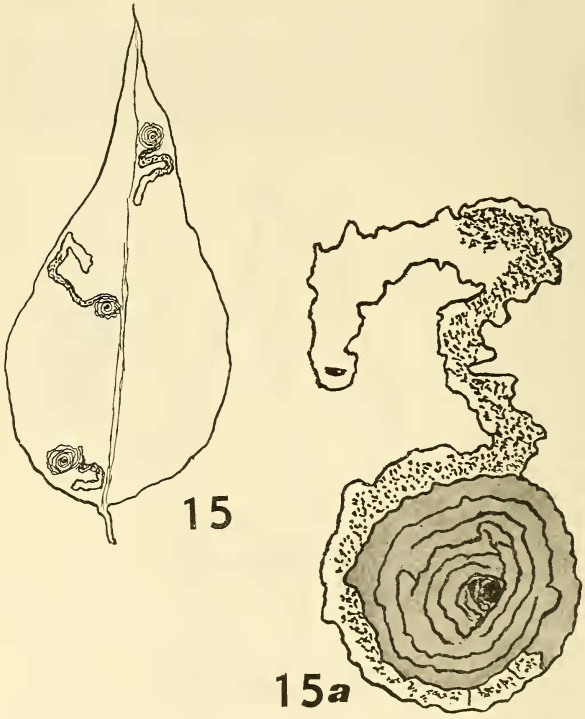

Figure 15, 15a. Mine of *Nepticula* sp. No. 3 on *Eucalyptus saligna*.

Nepticula sp. No. 3 (near *gilva*).

Mine type: Serpentine-expanded (Figures 15 and 15a).

Hosts: *E. saligna; E. acmenioides; E. pilularis.*

Localities: Lisarow; Pennant Hills, N.S.Wales.

Notes: Oviposition occurs on the dorsal cuticle of the leaf, and larvae emerge from the mines through a slit cut in the ventral leaf cuticle. They spin a tan-brown oval pupal case of coarse silk among debris on the ground. Larvae collected during July emerged as adults about 12 weeks later, the pupal exuviae protruding from the end of the cocoon after emergence of the adult. Larvae have been collected during June to September, January, March and April.

The peculiar shape of the mine of this species is distinctive. The early linear portion is constructed in contiguous circles outward from the egg capsule until the circular area is about 4 mm. to 5 mm. in diameter, so that the egg capsule is thus at the approximate centre of the circular area. In the circular area, mining occurs mainly in the palisade layer, but in later stages all of the parenchyma is destroyed so that this portion of the mine is translucent. The central circle of the mine is deep red in colour on the upper leaf surface, but is seen as an irregular brown patch on the lower surface. Position of the mine on a leaf is variable, and there may be several on one leaf.

Larvae may be yellow-green, yellowish or pinkish-orange to bright purple in colour.

Apanteles sp. (Braconidae) parasitises larvae of this species.

Nepticula sp. No. 4 (near *caenodera* or *endocapna*).

Mine type: Serpentine-expanded (Figure 16).

Hosts: *E. acmenioides; E. saligna; E. pilularis; E. microcorys.*

Locality: Lisarow; Olney East State Forest, N.S.Wales.

Notes: Eggs are laid on the dorsal surface of a leaf, and larvae have been collected during April and June to January. Last instar larvae are

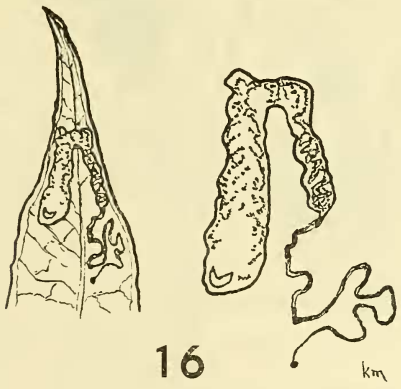

Figure 16. Mine of *Nepticula* sp. No. 4 on *Eucalyptus acmenioides.*

bright green with a black median dorsal marking, and they emerge through a crescentic slit cut in the upper leaf cuticle. They pupate in the soil in white silken cocoons, or on debris on the ground.

From pupation to emergence of the adult occupies about 8 weeks during early spring.

Position of the mine is variable from the base to the tip of a leaf, and its shape is distinctive. The palisade layer only is mined during the early instars, but both the palisade and the spongy parenchyma are destroyed in the expanded portion of the mine. When the upper epidermis and palisade, and the upper and lower spongy parenchyma are destroyed, a network of small leaf veins, and the oil glands, remain on the floor of the expanded portion of the mine. The upper cuticle of the expanded portion becomes light to tan-brown in colour, and black narrow lines of excreta are plainly visible adhering to the upper cuticle of the mine. The early serpentine portion is red-brown to black in colour.

A single braconid specimen, or 9 chalcidoid specimens, have emerged from one larva of this species of leaf-miner

Nepticula sp. No. 5.

Mine type: Serpentine (Figure 17).
Hosts: *E. acmenioides; E. pilularis.*
Locality: Lisarow, N.S.Wales.

Notes: The transparent bright green or purple last instar larvae emerge from the mine through the ventral leaf cuticle. Ingested food is clearly visible through their cuticle as a red median stripe. Larvae pupate in tan-brown silken cocoons just below the soil surface or on leaves, when

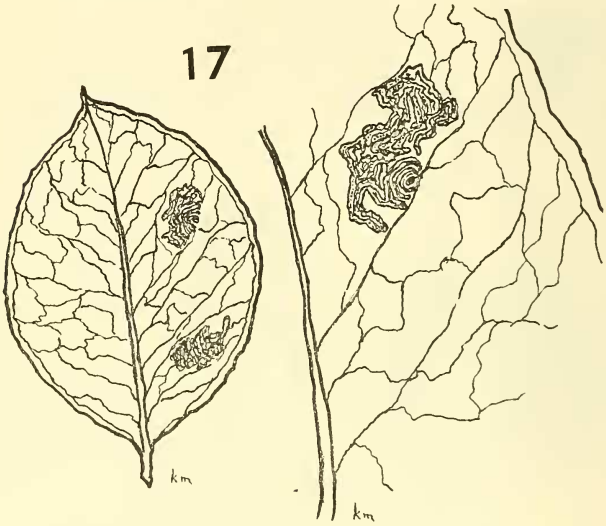

Figure 17. Mine of *Nepticula* sp. No. 5 on *Eucalyptus pilularis.*

reared in jars. The pupal exuviae is protruded from the end of the cocoon at the emergence of the adult. The time from the spinning of the cocoon to the emergence of the adult is about 8 months. Larvae were collected during June and July.

The position of the mine on a leaf is variable, and more than one mine may be found on the one leaf. Mines are tortuous, with the galleries contiguous, and the egg capsule is visible as a silvery spot on the dorsal cuticle near the centre of the mine. Mines are reddish-purple at first, later portions sometimes being silver in colour. The restricted translucent area denotes the distal end of the mine.

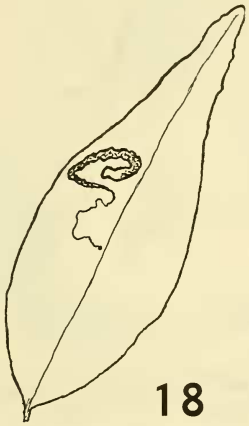

Figure 18. Nepticulid mine on *Asterolasia correifolia*.

Nepticulidae.
Mine type: Serpentine (Figure 18).
Host: *Asterolasia correifolia*.
Locality: Ourimbah State Forest; Lisarow, N.S.Wales.
Notes: Oviposition occurs on the upper leaf surface. Larvae have been collected during September, and February and March, and they leave the mine through a semicircular slit in the upper leaf cuticle. Mines are to be found on the upper leaf surface, and a dark central line of excreta may be seen in the mine.

Nepticulidae.
Mine type: Serpentine.
Host: *Pomaderris ligustrina*.
Locality: Lisarow, N.S.Wales.
Notes: Mines of this species are similar to those of the previous species.

Nepticulidae.
Mine type: Serpentine-linear-blotch (Figure 19).
Host: *E. acmenioides*.
Locality: Lisarow, N.S.Wales.
Notes: Larvae were collected during July. Eggs are laid on the dorsal leaf surface, and larvae leave the mines through the dorsal surface.

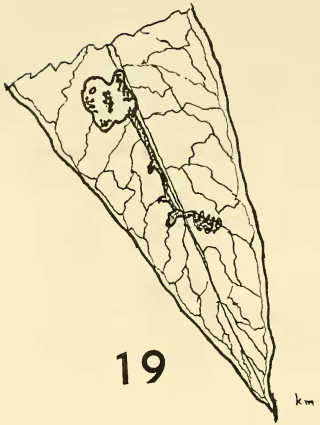

Figure 19. Nepticulid mine on *Eucalyptus acmenioides.*

Position of the mines on a leaf is variable, but usually close to the mid-vein of the leaf. The early part of the mine is reddish-brown with the linear portion light brown, the blotch area being darker brown. Frass is central in the linear portion, then distributed in small groups in the blotch area.

Nepticulidae.

Mine type: Serpentine (Figure 20).

Hosts: *E. acmenioides; E saligna; E. microcorys.*

Locality: Lisarow; Olney East State Forest, N.S.Wales.

Notes: The pale to bright green larvae have been collected during July, August, January and March. Oviposition occurs on the upper leaf surface, and the larvae leave the mine on the lower leaf surface to spin small dark brown cocoons on the base of the jar. The pupal exuviae is protruded from the case at emergence of the adult.

Mines usually occur on mature leaves of *E. acmenioides,* and on semi-mature leaves of *E. saligna,* and their position on the leaf is variable. The serpentine portion of the mine is seen as a thin grey line, with the digitate portion darker in colour. The distal portion is greyish-green, and the digitate part appears to be constructed solely in the spongy parenchyma. Excreta are seen as a black central line in the serpentine portion, and the edges of the excreta appear to follow the contours of the digitate portion.

Up to 4 chalcidoid specimens of parasites have emerged from one larva.

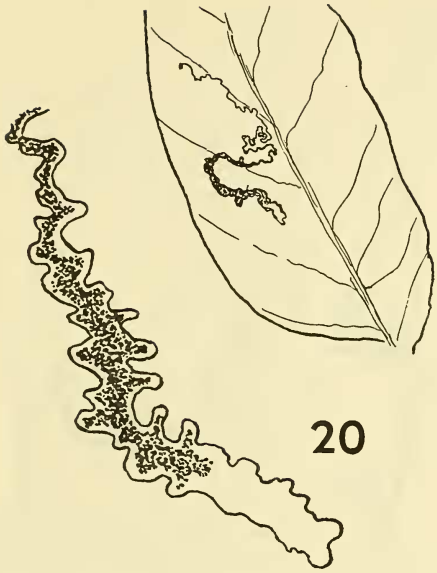

Figure 20. Nepticulid mine on *Eucalyptus saligna.*

Nepticulidae.

Mine type: Linear-blotch (Figure 21).

Host: *Angophora floribunda.*

Locality: Lisarow, N.S.Wales.

Notes: Oviposition usually occurs on the dorsal surface of a leaf, usually near the edge of the leaf. Last instar larvae make their exit through a crescentic slit on the ventral leaf surface, at the distal end of the blotch portion. Larvae were collected during October to December, and the time from pupation to the emergence of the adult is about 6 weeks.

Position of the mine on a leaf is variable, but usually toward the leaf edge. Up to 6 mines may occur on one leaf. Excreta of larvae may be spread over the central portion of the blotch area with the edges of the blotch remaining clear, and the mine perimeter is usually surrounded by a narrow line of purple staining.

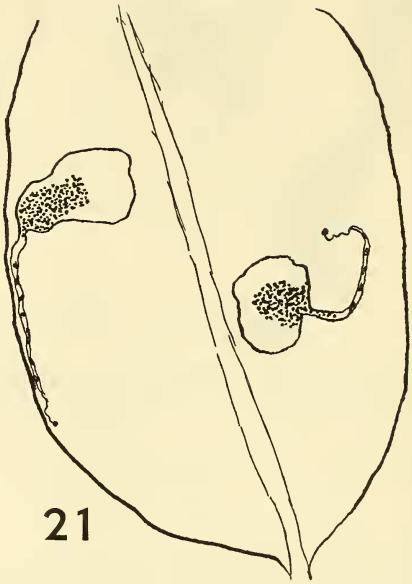

Figure 21. Nepticulid mine on *Angophora floribunda*.

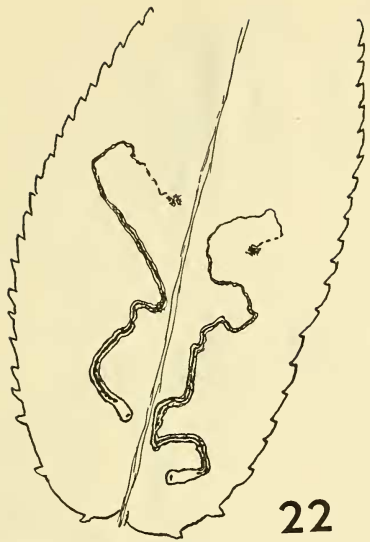

Figure 22. Nepticulid mine on *Rubus moorei.*

Nepticulidae.

Mine type: Linear (Figure 22).

Host: *Rubus moorei* F. Muell.

Locality: Lisarow, N.S.Wales.

Notes: Eggs are deposited within the leaf tissues, and the early portion of the mine is not visible on either leaf surface. The oviposition site is denoted by a reddish spot on the dorsal cuticle. Larvae were collected during September, mining in the dorsal area of a leaf. They leave the pale brown coloured mine from the dorsal surface, to pupate in small whitish cocoons on leaves or on the soil surface when reared in jars. Larvae are pale orange in colour.

Nepticulidae.

Mine type: Linear-expanded (Figure 23).

Host: *Banksia integrifolia* L.f.

Locality: Boat Harbour (Central Coast), N.S.Wales.

Notes: Larvae leave the mines from the upper leaf surface.

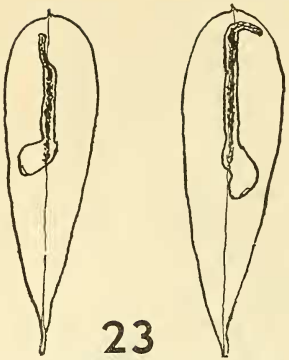

Figure 23. Nepticulid mine on *Banksia integrifolia.*

Nepticulidae.

Mine type:	Linear (Figure 24).
Host:	*Banksia serrata* L.f.
Locality:	Boat Harbour, N.S.Wales.
Notes:	Larvae leave the mines from the lower leaf surface.

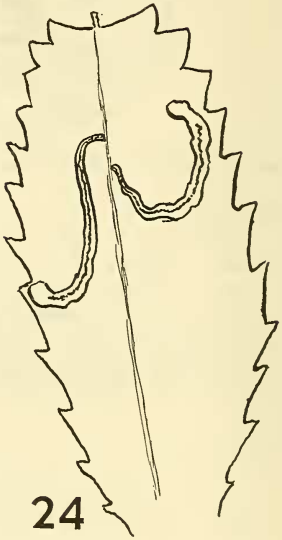

Figure 24. Nepticulid mine on *Banksia serrata.*

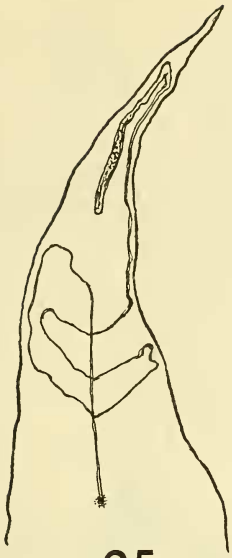

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Figure 25. Mine of *Heliozela prodela* about half constructed on *Eucalyptus acmenioides.*

C. Family Heliozelidae.

Heliozela prodela Meyrick.

Mine type: Linear-blotch (Figure 25).

Hosts: *A. floribunda; E. acmenioides; E. saligna; E. pilularis; E. gummifera.*

Localities: Lisarow; Sydney, N.S.Wales.

Notes: Oviposition occurs in the mid-vein from ¼" to 1" from the tip of a leaf, and the site is denoted by callous tissue. Larvae have been collected during May to July. First instar larvae mine along the mid-vein toward the tip of a leaf, then back and forth across the tip in the secondary venation; or they may first mine along a lateral vein toward the leaf edge, then along the vein just inside the leaf edge, to return to the mid-vein and then back and forth across the leaf tip 3 or 4 times in the secondary venation. The mines become red and are prominently visible against the green leaf. The area distal to the basal line of the mine becomes pale green to yellow. The last instar larva mines down along the mid-vein for a variable distance, then mines most of the parenchyma in the leaf tip, thus forming a blotch mine. This area turns light brown dorsally, and from this area a small convex oval case about 4 mm. by 2 mm. is cut out either on or near the mid-vein, and within the area of previous mining, and shed from the leaf. The dorsal

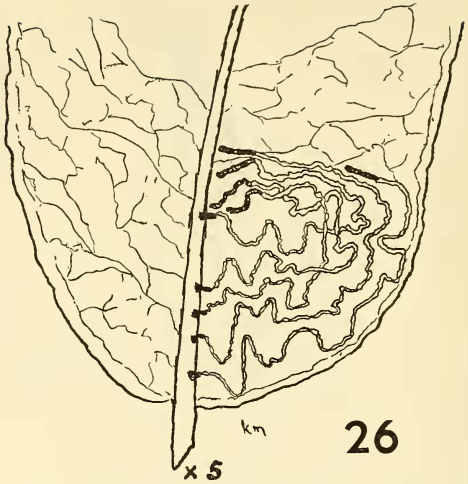

Figure 26. Early stage of heliozelid mines on *Eucalyptus saligna*.

side of the case is dark grey and the ventral side light grey on *A. floribunda*. The internal surface of the case is covered with white silk.

The early portion of the mine may be destroyed as the blotch area is constructed, and there is usually an area of staining around the mine. More than one mine may occur on a leaf.

Cases may be constructed during May, June and January, so that there appears to be more than one generation each year. From those cases constructed during May, adults emerged during September. The pupal exuviae protrudes from the end of the case as the adult emerges.

Heliozelidae.

Mine type: Linear-blotch (Figure 26).

Hosts: *E. saligna; E. grandis; E. acmenioides.*

Locality: Lisarow, N.S.Wales.

Notes: Oviposition occurs at the edge of the mid-vein on the ventral leaf surface, where a swelling of the tissues may be seen. Up to 6 eggs may be placed more or less contiguously, resulting in an area of dead tissue on the vein, and the base of the leaf below the mines becomes grey-green, often to dry out before the larvae mature. Larvae commence mining in the spongy parenchyma only, moving toward the leaf edge, then turn to cross the mid-vein after about 7 days.

Early portions of the mines are constructed in a forward direction only, and larvae fit closely in the mines which are not extended laterally until the blotch area is commenced. The small, fine venation of the leaf is retained on the leaf cuticle inside the blotch area, so that the pupal cases cut from the blotch area show the darker green network of the venation against the cream-coloured background. From the commencement of the cutting out of the pupal case until its completion and separation from the leaf, occupies

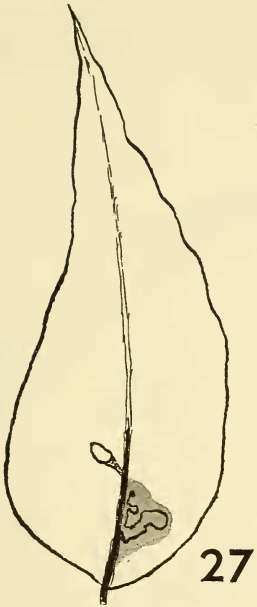

Figure 27. Heliozelid mine on *Eucalyptus pilularis*.

about 7 hours, and the time taken from the commencement to completion of the mine is about one month during June and July. From larvae collected during May to July, adults emerged during September.

Larvae are translucent yellow-green.

Heliozelidae.

Mine type: Linear (Figure 27).

Hosts: *A. floribunda; E. pilularis.*

Locality: Lisarow, N.S.Wales.

Notes: Oviposition occurs between the mid-vein and the edge of the leaf toward its base, and the area is surrounded by a deep red, more or less circular, stain. Larvae were collected during June and September.

After usually mining to the edge of the leaf, the larva continues to mine along the edge for a short distance, then back to the mid-vein which is followed toward the tip of the leaf for about two-thirds of its length. The early mine appears as a thin red line and the mid-vein turns black. Young larvae sometimes mine to the mid-vein before reaching the side of the leaf, mine to its base, then turn upward toward the tip of the leaf. The entire leaf becomes pink, and then yellow-pink, and falls to the ground.

Last instar larvae are deep pink, and construct cases by diverging from the mid-vein for a short distance, constructing a restricted blotch area contiguous to the vein, where a pupal case is constructed. This case is lined with silk and is usually attached at an angle to an object by means of a small pad of silk at the end of the case.

Figure 28. ? Heliozelid mine on *Eucalyptus stricta*.

? Heliozelidae.

Mine type: Linear (Figure 28).

Host: *Eucalyptus stricta* Sieb.

Locality: Kanangra Walls, N.S.Wales.

Notes: Oviposition occurs toward the base of the leaf, between the mid-vein and the edge of the leaf, usually two-thirds to three-quarters of the distance from the tip to the base. Larvae were collected during August.

Mining toward the base of the mid-vein, the larva then crosses the mid-vein and continues toward the tip of the leaf for a distance about equal to that on the other side of the mid-vein, and so that the portion of the mine each side of the mid-vein is equiangular to the mid-vein. An area of callous tissue forms on the mid-vein. Two short lateral channels are also mined, one on each side of the mid-vein.

Oval cases in which the larvae pupate are cut from the distal end of the mine, and are lined with silk. Up to 3 mines may occur on one leaf. Pupal cases are cream with a pale brownish suffusion.

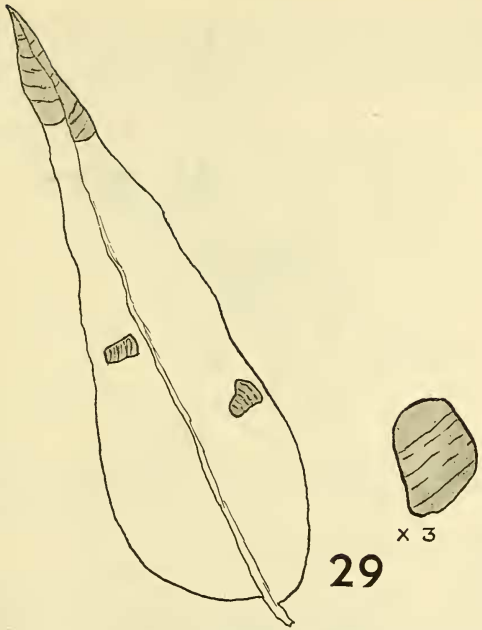

Figure 29. Mine of *"Tinea"* sp. on *Eucalyptus saligna.*

D. Family Incurvariidae.

"Tinea" sp. (in *spodina* group.)

Mine type: Blotch (Figure 29).

Host: *E. saligna.*

Locality: Ourimbah State Forest; Lisarow; Gosford, N.S.Wales.

Notes: Larvae collected during August and September emerged during the following March. Larvae are cream in colour and pupal cases are dark brown, almost rectangular in shape, with fine, dark transverse striations.

The position of the mine on the leaf is variable, and often the tissues of the tip of the leaf are mined. More than one mine may occur on the one leaf. The shape of the dark brown blotch area is usually oblong to square, with distinctive darker fine transverse lines. The mined area is filled with larval excreta around the perimeter, and an area of deep purplish staining occurs around the edges.

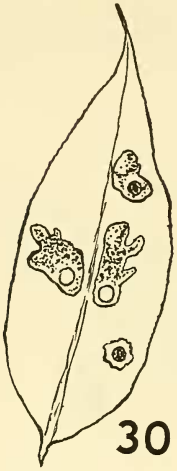

Figure 30. Mine of *"Tinea"* sp. on *Eucalyptus acmenioides.*

"Tinea" sp. (near *spodina.*)

Mine type: Blotch (Figure 30).

Hosts: *E. acmenioides; E. saligna; E. pilularis.*

Locality: Lisarow, N.S.Wales.

Notes: Oviposition occurs below the cuticle of the leaf. Larvae are cream in colour, with the segments flattened laterally; the head is brown and retractile into the prothoracic segment to the base of the mandibles. They have been collected during June to early September, and those collected during June and July emerged as adults during the following March, so that a lengthy larval diapause occurs in the pupal case. Pupal exuviae are protruded from the cases as the adults emerge.

Position of the mine on a leaf is variable, and there are often several mines on one leaf. The outer edges of the mine are translucent, with particles of excreta clearly visible. The centre of the mined area, which later constitutes the case in which the larva pupates, is at first filled with excreta and later covered with silk. This area is dark brown, and the outer edges of the mine are surrounded with an area of reddish-purple staining.

Chalcidoid parasites which emerged by way of a small circular hole cut in the centre of the pupal case, were reared during May.

"Tinea" sp. (near *pentaspila* Meyrick.)

Mine type: Blotch (Figure 31).

Hosts: *Eucalyptus sieberi* L. Johnson.

Locality: Blackheath, N.S.Wales.

Notes: Position of the mine on a leaf is variable, and more than one may occur on the same leaf. Mines are at first red-brown, then dark grey-brown in a later stage of construction. The early mine is filled with

excreta, while in the later portion it is scattered throughout the translucent area. A more or less oval to pear-shaped pupal case is cut out from the translucent part, and is shed from the leaf. Cases are about 5.5 mm. in length and 3 mm. wide, grey-brown and lined with silk. A purple stain occurs along the edge of the mine, and extends outward along the leaf venation.

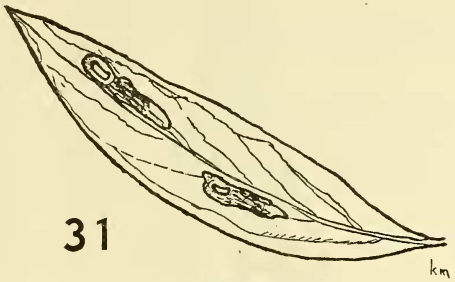

Figure 31. Mine of *"Tinea"* sp. on *Eucalyptus sieberi*.

"Tinea" sp.

Newman & Clark (1945) record that hosts of this Western Australian species are *E. marginata* Donn ex Sm; *E. rudis* Endl.; and the species is accidental to *E. gomphocephala* A.DC., *E. salubris* F. Muell. and *E. transcontinentalis* Maiden.

E. Family Tineidae.

"Tinea" nectarea Meyrick.

Mine type: Blotch (Figure 32).

Hosts: *E. acmenioides; E. pilularis; E. saligna.*

Localities: Lisarow; Sydney; Lawson, N.S.Wales.

Notes: Larvae of this species pull around with them a case which serves as their shelter when they are not mining. They have been collected during August to April.

Prior to construction of the first case, two leaves of the host plant are held together with strands of silk between which the larvae feed and from which they extrude their excreta. The first case is cut from these two leaves and larvae then move to a new leaf to which the case is attached by strong strands of silk. Larvae then commence mining from the point of attachment to the leaf. The point of attachment is later indicated by a small round hole in the leaf cuticle through which the larvae mine the parenchyma between the leaf cuticles, so that the mines appear translucent. Although larvae usually attach their cases to the ventral leaf surface, some may feed from the dorsal surface. While mining, larvae often leave the case to extend the mine beyond their own length, but always return to the case to void excreta through the posterior end of the case. The cases, later formed from the upper and lower cuticles of the one leaf, are pale fawn, with a raised median ridge on each side from the anterior to the posterior exits. Cases constructed by last instar larvae are up to 10 mm. long and 10 mm. wide. The portion of the upper leaf cuticle surrounding the mine may be partly or wholly stained with

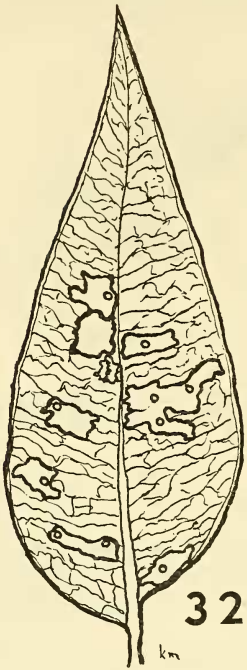

Figure 32. Mine of *"Tinea" nectarea* on *Eucalyptus saligna.*

purple, but this does not occur on the lower leaf cuticle. The round entrance hole to the mine is about 1.5 mm. in diameter.

Last instar larvae may move to the stem of the leaf. or to the twig, to attach their cases with a circular pad of silk, in which they pupate.

There appear to be two or three generations of this species each year, adults emerging three weeks after pupation during November, December, February or May. The pupal exuviae is protruded from the lower end of the case, and recently emerged adults cling to the pupal exuviae while their wings expand and dry.

F. Family Glyphipterygidae.

Eupselia sp. (near *carpocapsella* Walker.)

Mine type: Linear (Figure 33).

Hosts: *E. saligna; E. acmenioides.*

Locality: Lisarow, N.S.Wales.

Notes: Larvae have been collected during June to September, and those found during July were in mines half constructed. When the mine is completed, larvae leave it to feed externally during the last instar when jagged-edged holes are eaten in the leaf. Last instar larvae are about 15 mm. in length.

Mining commences near the mid-vein and extends towards the edge of the leaf along the secondary venation. The early portion of the mine is dark brown, and the later portions are pale brown. All of the parenchyma is destroyed and excreta are voided from the mine through a round hole at the proximal end of the mine. There may be 3 holes in the length of the mine. After leaving the mine and feeding externally, the larva constructs a tube on the surface of the leaf with leaf fragments attached to the leaf cuticle, in which the larva shelters while not feeding. The open-ended tube is completed in about 3 days.

Larvae pupate externally on the leaf surface, a pupa being attached to a pad of silk by its cremaster.

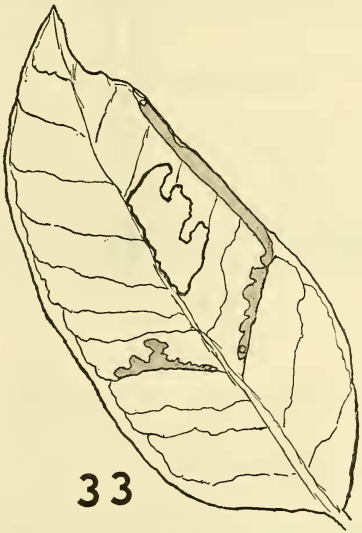

Figure 33. Mine of *Eupselia* sp. and area of damage on leaf of *Eucalyptus acmenioides.*

Figure 34. Mine of *Epiphthora* sp. on *Lomandra longifolia*.

G. Family Gelechiidae.

Epiphthora sp. (=*Apatetris* of Meyrick.)

Mine type: Linear (Figure 34).

Host: *Lomandra longifolia* Labill.

Locality: Lisarow, N.S.Wales.

Notes: Larvae collected during September emerged as adults during October and November. Larvae are dark brown, and leave the mine to pupate in the soil in silken cocoons.

Epiphthora sp.

Mine type: Linear.

Host: *Dianella caerulea* Sims.

Locality: Lisarow, N.S.Wales.

Notes: Larvae collected during September emerged as adults during October and November. Oviposition occurs on the central leaf vein on the upper surface, or near the edge of the leaf on the lower surface. The mines are similar in appearance to those of the previous species. Larvae are distinctive, with 4 broad dark transverse bands separated by broad pale bands. Pupation occurs in the soil. At least two generations occur each year, larvae also being present during January and February.

Gnoremoschema operculella (Zell.).

This species, commonly known as the "potato moth" attacking *Solanum tuberosum* L. is well known, and the N.S.W. Department of Agriculture has published information in Insect Pest Leaflet No. 90.
Gnoremoschema phasiosema (Turner).

Larvae of this species are reported as damaging stems of *Lycopersicum esculentum* Mill., as well as the leaves of older plants (N.S.W. Agricultural Gazette, Feb. 1954, pp. 105-6).

H. Family Cosmopterygidae.

Gen. et sp. indet.

Mine type: Linear.

Host: *Gahnia melanocarpa* R.Br.

Locality: Lisarow, N.S.Wales.

Notes: Larvae were collected during September and emerged as adults during October. They bear a narrow dark longitudinal stripe for most of their length, each side of the median area. They attach themselves to the leaves or other support with a thread of silk, and always pupate while lying in a horizontal position.

J. Family Lyonetiidae.

Stegommata sulphuratella Meyrick

Mine type: Blotch (Figure 35).

Host: *Banksia integrifolia.*

Locality: Boat Harbour (Central Coast), N.S.Wales.

Notes: Larvae have been collected during April They are greenish-white in colour, and are suspended inside the mine on the upper leaf cuticle by silken threads, to pupate. A brownish blotch mine is formed at the distal tip of a leaf to about half of its length. The base of the floor of the mine is slightly concave and the upper cuticle forming the "roof" of the mine is horizontal.

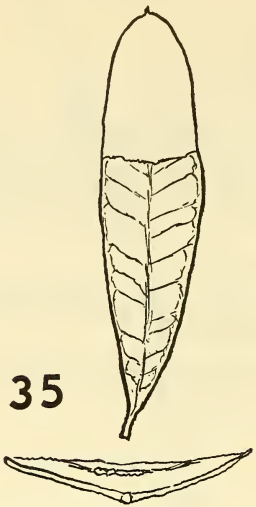

Figure 35. Mine of *Stegommata sulphuratella* on *Banksia integrifolia,* and section showing suspended pupa.

K. Family Tortricidae.

Peraglyphis atimana (Meyrick).

Larvae of this species mine in the leaves of *Grevillea robusta* A. Cunn. ex R.Br., and have been collected during January and February at Sydney.

Most of the Lepidopterous mines studied are held between celluloid sheets, in the collection of the Forestry Commission of New South Wales.

COLEOPTERA.

A. Family Curculionidae.

Larvae of *Cydmaea diversa* Lea, *C. eucalypti* Lea and *C. luctuosa* Pascoe, have been reported as mining in the foliage of *Hakea teretifolia, H. sericea* and *H. teretifolia* respectively (Moore 1964).

B. Family Chrysomelidae.

Halticorcus platycerii Lea.

This species was reared during September from mines occurring in leaves of the indigenous *Platycerium grande* (Fée) J.Sm. ex Presl. (staghorn) occurring at Lisarow, N.S.Wales. Some biology of the species is given in the N.S.W. Department of Agriculture Insect Pest Leaflet No. 62.

DIPTERA.

Family Agromyzidae.

Japanagromyza eucalypti Spencer.

Mine type: Linear-blotch.

Host: *E. camaldulensis* Dehn. (Specimen planted from nursery stock).

Locality: Lisarow, N.S.Wales.

Notes: This species was first reared from very young foliage of a host plant which had been transplanted from the Narrandera (N.S.Wales) nursery of the Forestry Commission of N.S.W., to Lisarow. A larva collected on 6th February, pupated on 7th, the adult emerging on 23rd February. Wasp parasites emerging during February were also reared from larvae.

This species is the first true agromyzid recorded as feeding on any species of *Eucalyptus* (Spencer 1963:309).

Melanagromyza atomella (Malloch).

Mine type: Linear (Figure 36).

Hosts: *Angophora floribunda; Hydrangea macrophylla* Ser.

Locality: Lisarow, N.S.Wales.

Notes: An extensive list of hosts is given by Spencer (1963). The silver-coloured mine of the specimen reared from *A. floribunda* is reproduced in Figure 36. Larvae were collected, and emerged as adults, during October. They pupate at the distal extremity of the mine and adults emerge through the upper cuticle of the leaf.

Melanagromyza phaseoli (Tryon).

This species is the common pest of cultivated beans, and some of its biology is recorded by Spencer (1963).

Ophiomyia lantanae (Froggatt).

Although this species is not a leaf-miner, it is included here because of its association with the forestry problem of the control of *Lantana camara* L. on State Forests in N.S.Wales.

O. lantanae is common in coastal N.S.Wales, at least as far south as Sydney, where numerous fruits of *L. camara* are attacked. Contrary to Spencer's comment (1963:324) it has been found to attack the seed within the fleshy fruit, as well as mining in the flesh surrounding the seed, so that the reproductive potential of the seed may be destroyed. Some plants have been damaged to such an extent that almost every seed has been destroyed, although control of the host plant in N.S.Wales by *O. lantanae* is ineffectual.

Calicomyza humeralis (U.R.).

Mine type: Blotch.

Host: *Erigeron bonariensis* L.

Locality: Sydney, N.S.Wales.

Notes: Adults of this species have been reared from mines on the host plant growing in Sydney streets during January and February. The white mines in the foliage may occur anywhere on the upper leaf surface, and several mines may occur on the one leaf. More than 60 mines have been counted on the one small plant, and mines may be 5 mm. in width and up to 18 mm. in length.

A small brown or black spot on the cuticle of the leaf above the mine indicates the pupation site of the larva within the mine.

A number of indigenous Agromyzidae not reared by the writer, are given by Spencer (1963), and are listed in the appendix to this paper. Introduced species are given by Spencer (pp. 306-7).

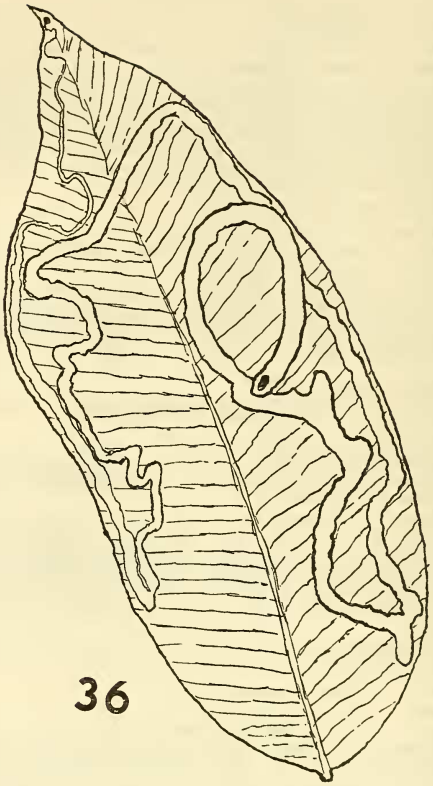

Figure 36. Mine of *Melanagromyza atomella* on *Angophora floribunda*.

HYMENOPTERA.

Family Argidae.

Schizocerella pilicornis (Holmgren).

Benson (1963) refers to this species as mining in *Portulaca oleracea* L., and as a species introduced from America.

Family Tenthredinidae.

Phylacteophaga froggatti Riek.

Considerable damage to several hosts utilised as amenity plantings, and some of the insect's biology, have been recorded by Hadlington (1954). Hosts mentioned are:— *E. maculata* Hook.; *E. citriodora* Hook.; *E. botryoides* Sm.; *E. robusta; E. sideroxylon* (A. Cunn.) Benth. partim; *E. globulus* Labill.; *E. ficifolia* F. Muell.; *E. cladocalyx* F. Muell. Specimens have been collected from Sydney, Scone and Tamworth, N.S.Wales. Pupation occurs within the mine.

P. froggatti var.

Mine type: Blotch.

Host: *E. saligna.*

Locality: Lisarow, N.S.Wales.

Notes: Mines of this variety appear to be the same as those of *P. froggatti,* and it has been observed that attack is confined to coppice, regeneration and young stock up to about 10 ft. in height.

Larvae were collected during July to January, and up to 6 mines may occur on the one leaf. A purplish staining on the upper leaf cuticle occurs around the proximal narrow portion of the mine where oviposition occurs. Blisters formed by mining larvae are dark brown in colour, and always occur on the upper leaf surface.

Parasites reared from specimens include *Bracon* sp. (Braconidae) and a species of chalcidoid, which is often numerous and exerts considerable control of some populations.

APPENDIX.
Leaf-miner Association with Host species.

Leaf-miner Species	Host-plant Species
ORDER COLEOPTERA	
Family Chrysomelidae	
Halticorcus platycerii	*Platycerium grande*
Family Curculionidae	
Cydmaea diversa	*Hakea teretifolia*
C. eucalypti	*H. sericea*
C. luctuosa	*H. teretifolia*
ORDER DIPTERA	
Family Agromyzidae	
Agromyza testacea	?
? *Agromyza* sp.	*Oplismenus compositus*
Calicomyza humeralis	*Erigeron bonariensis*
Cerodontha australis	?
C. robusta	?
C. vittigera	?
Japanagromyza eucalypti	*Eucalyptus camaldulensis*
? *Liriomyza* sp.	*Billardiera scandens*
L. australina	?
L. brassicae	*Tropaeolum major* *Gynandropsis speciosa* *Raphanus raphanistrum* *Diplotaxis muralis* CRUCIFERAE CAPPARIDACEAE
L. caulophaga	?
L. chenopodii	*Beta vulgaris* *Spinacia oleracea* *Stellaris media* Wallflower
L. helichrysi	*Helichrysum bracteatum*
L. obscurata	?
L. pallidicentralis	?
L. singularis	?
L. tricolor	?
Melanagromyza albisquama	?
M. alternata	?
M. alysicarpi	*Alysicarpus vaginalis* *A. nummularifolius*
M. apii	*Apium graveolens* Celery (cultivated)
M. atomella	*Angophora floribunda* *Barringtonia gracilis* *Celastrus subspicatus* *Doryphora sassafras* *Hydrangea macrophylla* *Marsdenia rostrata* *Passiflora suberosa* *Stephania japonica* *Tylophora barbata* (see also Spencer 1963)
M. bowralensis	?
M. cassiae	*Cassia bicapsularis* ? *Erythrina* sp.
M. centrosematis	*Centrosema pubescens* *Glycine soja*

M. conspicua	COMPOSITAE
M. dianellae	*Dianella caerulea*
	Eusteplius sp.
M. indigopherae	*Indigophera australis*
	I. suffruticosa
M. metallica	? COMPOSITAE
M. murrayae	*Murraya paniculata*
M. paramonovi	*?.*
M. phaseoli	*Phaseolus lathyroides*
	Cajanus sp.
	Crotalaria sp.
	Dolichos sp.
	Soja sp.
	Vigna sp.
M. piliseta	*?*
M. pisi	*Pisum sativum*
M. placida	*?*
M. seneciophila	*Senecio vagus*
M. sojae	LEGUMINOSAE
	Cajanus sp.
	Glycine sp.
	Phaseolus sp.
	Swainsona galegifolia
M. specifica	*?*
M. trispina	*?*
M. verdescens	*?*
M. wilkstroemiae	*Wilkstroemia indica*
	Pimelea ligustrina
Melanagromyza sp.	*Desmodium polycarpum*
	Senecio pterophorus
Opliomyia angustilunula	*?*
O. australis	*?*
O. goodeniae	*Goodenia ovata*
O. lantanae	*Lantana camara*
O. micra	*?*
O. solanicola	*Solanum prinophyllum*
Pseudonapomyza spicata	*Brachiaria miliformis*
	Elusine indica
	Zea sp.
Phytobia caliginosa	GRAMINEAE
P. humeralis	*?*
	Aster subulatus
	Aster sp.
	Erigeron bonariensis
P. incerta	*?*
P. poemyzina	? CYPERACEAE
P. triplicata	? *Juncus* sp.
Phytoliriomyza australiensis	*?*
Phytomyza atricornis	*Bidens pilosa*
	Chrysanthemum maximum
	Cirsium vulgare
	Coreopsis sp.
	Helichrysum rutidolepis
	Senecio dryadeus
	S. lautus
	S. linearifolius
	S. minimus
	S. pterophorus
	Sonchus oleraceus
P. clematidicolla	*Clematis aristata*
P. plantaginis	*Plantago* spp.

P. vitalbae	*Clematis aristata*
	C. montana
?	*Cassinia aculeata*
?	*C. aureonitens*
	Helichrysum dendroideum
?	*Goodenia ovata*
	Senecio sp.

ORDER HYMENOPTERA

Family Argidae

Schizocerella pilicornis	*Portulaca oleracea*

Family Tenthredinidae

Phylacteophaga froggatti	*Eucalyptus botryoides*
	E. citriodora
	E. cladocalyx
	E. ficifolia
	E. globulus
	E. maculata
	E. robusta
	E. sideroxylon
P. froggatti var.	*E. saligna*

ORDER LEPIDOPTERA

Family Cosmopterygidae

?	*Gahnia melanocarpa*

Family Gelechiidae

Epiphthora sp.	*Lomandra longifolia*
Epiphthora sp.	*Dianella caerulia*
Gnoremoschema operculella	*Solanum tuberosum*
G. phaseosema	*Lycopersicum esculentum*

Family Glyphipterygidae

Eupselia sp. nr. *carpocapsella*	*E. acmenioides*
	E. saligna

Family Gracilariidae

Acrocercops calicella	*Eucalyptus acmenioides*
A. chionosema	*Macadamia alternifolia*
A. hoplocala	*E. saligna*
A. laciniella	*Angophora costata*
	A. floribunda
	E. acmenioides
	E. pilularis
	E. saligna
A. macaria	*Euodia micrococca*
A. ordinatella	*Cinnamonum camphora*
A. plebeia	*Acacia podalyrifolia*
A. nr. *argyrodesma*	*Hakea salicifolia*
Acrocercops sp. nov. ?	*E. radiata*
Acrocercops sp.	*Asterolasia correifolia*
Acrocercops sp.	*Pomaderris ligustrina*
Gracilaria xanthopharella	*Glochidion ferdinandi*
Parectopa ida	*Angophora floribunda*
	E. acmenioides
	E. gummifera
	E. paniculata
	E. pilularis
	E. robusta
	E. saligna
Phyllocnistis diaugella	*Breynia oblongifolia*
Phyllocnistis sp. nov. ?	*Hibbertia scandens*

Family Heliozelidae

Heliozela prodela	*Angophora floribunda*
	E. acmenioides
	E. gummifera
	E. pilularis
	E. saligna
Heliozela sp. ?	*E. acmenioides*
	E. grandis
	E. saligna
Heliozela sp. ?	*Angophora floribunda*
	E. pilularis
Heliozela sp. ?	*E. stricta*

Family Incurvariidae

"Tinea" sp. (*spodina* group)	*E. saligna*
"Tinea" sp. nr. *pentaspila*	*E. acmenioides*
	E. pilularis
	E. saligna
"Tinea" sp. nr. *pentaspila*	*E. sieberi*
"Tinea" nectarea	*E. acmenioides*
	E. pilularis
	E. saligna

Family Lyonetiidae

Stegommata sulphuratella	*Banksia integrifolia*

Family Nepticulidae

Nepticula phyllanthina	*Glochidion ferdinandi*
Nepticula funeralis ?	*E. acmenioides*
	E. pilularis
Nepticula sp. (*funeralis group*)	*E. grandis*
	E. microcorys
	E. saligna
Nepticula sp. No. 1.	*Angophora floribunda*
	E. acmenioides
	E. grandis
	E. saligna
Nepticula sp. No. 2.	*A. floribunda*
	E. acmenioides
	E. pilularis
	E. saligna
Nepticula sp. No. 3.	*E. acmenioides*
	E. pilularis
	E. saligna
Nepticula sp. No. 4.	*E. acmenioides*
	E. microcorys
	E. pilularis
	E. saligna
Nepticula sp. No. 5.	*E. acmenioides*
	E. pilularis
Nepticula sp.	*Asterolasia correifolia*
Nepticula sp.	*Pomaderris ligustrina*
Nepticula sp.	*E. acmenioides*
Nepticula sp.	*E. acmenioides*
	E. microcorys
	E. saligna
Nepticula sp.	*Angophora floribunda*
Nepticula sp.	*Rubus moorei*
Nepticula sp.	*Banksia serrata*
Nepticula sp.	*B. integrifolia*

Family Tortricidae

Peraglyphis atimana	*Grevillea robusta*

HOST AND LEAF-MINER ASSOCIATIONS

Host	Leaf-miner species	Order	Family
Acacia podalyriifolia	*Acrocercops plebeia*	Lepidoptera	Gracilariidae
Alysicarpus nummularifolius	*Melanagromyza alysicarpi*	Diptera	Agromyzidae
A. vaginalis	*Melanagromyza alysicarpi*	Diptera	Agromyzidae
Angophora costata	*Acrocercops laciniella*	Lepidoptera	Gracilariidae
A. floribunda	*Melanagromyza atomella*	Diptera	Agromyzidae
A. floribunda	*Acrocercops laciniella*	Lepidoptera	Gracilariidae
A. floribunda	*Parectopa ida*	Lepidoptera	Gracilariidae
A. floribunda	*Nepticula* sp. No. 1	Lepidoptera	Nepticulidae
A. floribunda	*Nepticula* sp. No. 2	Lepidoptera	Nepticulidae
A. floribunda	? sp.	Lepidoptera	Nepticulidae
A. floribunda	*Heliozela prodela*	Lepidoptera	Heliozelidae
A. floribunda	?	Lepidoptera	Heliozelidae
Apium graveolens	*Melanagromyza apii*	Diptera	Agromyzidae
Aster sp.	*Phytobia humeralis*	Diptera	Agromyzidae
Aster subulatus	*Phytobia humeralis*	Diptera	Agromyzidae
Asterolasia correifolia	*Nepticula* sp.	Lepidoptera	Nepticulidae
Asterolasia correifolia	*Acrocercops* sp.	Lepidoptera	Gracilariidae
Banksia integrifolia	*Stegommata sulphuratella*	Lepidoptera	Lyonetiidae
B. serrata	?	Lepidoptera	Nepticulidae
Barringtonia gracilis	*Melanagromyza atomella*	Diptera	Agromyzidae
Beta vulgaris	*Liriomyza chenopodii*	Diptera	Agromyzidae
Bidens pilosa	*Phytomyza atricornis*	Diptera	Agromyzidae
Billardiera scandens	*Liriomyza* sp.	Diptera	Agromyzidae
Brachiaria miliformis	*Pseudonapomyza spicata*	Diptera	Agromyzidae
Breynia oblongifolia	*Phyllocnistis diaugella*	Lepidoptera	Gracilariidae
Cajanus sp.	*Melanagromyza phaseoli*	Diptera	Agromyzidae
CAPPARIDACEAE	*Lyriomyza brassicae*	Diptera	Agromyzidae
Cassia bicapsularis	*Melanagromyza cassiae*	Diptera	Agromyzidae
Cassinia aculeata	?	Diptera	Agromyzidae
C. aureonitens	?	Diptera	Agromyzidae
Celastrus subspicatus	*Melanagromyza atomella*	Diptera	Agromyzidae
Centrosema pubescens	*M. centrosematis*	Diptera	Agromyzidae
Chrysanthemum maximum	*Phytomyza atricornis*	Diptera	Agromyzidae
Cinnamomum camphora	*Acrocercops ordinatella*	Lepidoptera	Gracilariidae
Cirsium vulgare	*Phytomyza atricornis*	Diptera	Agromyzidae
Clematis aristata	*P. clematidicollis*	Diptera	Agromyzidae
C. montana	*P. vitalbae*	Diptera	Agromyzidae
COMPOSITAE	*Melanagromyza conspicua*	Diptera	Agromyzidae
do. ?	*M. metallica*	Diptera	Agromyzidae
Coreopsis sp.	*Phytomyza atricornis*	Diptera	Agromyzidae
Crotalaria sp.	*Melanagromyza phaseoli*	Diptera	Agromyzidae
CRUCIFERAE	*Liriomyza brassicae*	Diptera	Agromyzidae
CYPERACEAE ?	*Phytobia poemyzina*	Diptera	Agromyzidae
Desmodium polycarpum	*? Melanagromyza* sp.	Diptera	Agromyzidae
Dianella caerulea	*Melanagromyza dianellae*	Diptera	Agromyzidae
	Epiphthora sp.	Lepidoptera	Gelechiidae
Diplotaxis muralis	*Liriomyza brassicae*	Diptera	Agromyzidae
Dolichos sp.	*Melanagromyza phaseoli*	Diptera	Agromyzidae
Doryphora sassafras	*M. atomella*	Diptera	Agromyzidae
Eleusine indica	*Pseudonapomyza spicata*	Diptera	Agromyzidae
Erigeron bonariensis	*Calicomyza humeralis*	Diptera	Agromyzidae
	Phytobia humeralis	Diptera	Agromyzidae
Erythrina sp. ?	*Melanagromyza cassiae*	Diptera	Agromyzidae
Eucalyptus acmenioides	*Acrocercops calicella*	Lepidoptera	Gracilariidae
	A. laciniella	Lepidoptera	Gracilariidae
	Parectopa ida	Lepidoptera	Gracilariidae
	Nepticula ? funeralis	Lepidoptera	Nepticulidae
	Nepticula sp. No. 1	Lepidoptera	Nepticulidae

	Nepticula sp. No. 2	Lepidoptera	Nepticulidae
	Nepticula sp. No. 3	Lepidoptera	Nepticulidae
	Nepticula sp. No. 4	Lepidoptera	Nepticulidae
	Nepticula sp. No. 5	Lepidoptera	Nepticulidae
	?	Lepidoptera	Nepticulidae
	Heliozela prodela	Lepidoptera	Heliozelidae
	?	Lepidoptera	Heliozelidae
	"Tinea" sp. nr. *spodina*	Lepidoptera	Incurvariidae
	"Tinea" nectarea	Lepidoptera	?
	Eupselia nr. *carpocapsella*	Lepidoptera	Glyphipterygidae
Eucalyptus botryoides	*Phylacteophaga froggatti*	Hymenoptera	Tenthredinidae
E. camaldulensis	*Japanagromyza eucalypti*	Diptera	Agromyzidae
E. citriodora	*Phylacteophaga froggatti*	Hymenoptera	Tenthredinidae
E. cladocalyx	*Phylacteophaga froggatti*	Hymenoptera	Tenthredinidae
E. ficifolia	*Phylacteophaga froggatti*	Hymenoptera	Tenthredinidae
E. globulus	*Phylacteophaga froggatti*	Hymenoptera	Tenthredinidae
E. grandis	*Nepticula* sp. (*funeralis* group)	Lepidoptera	Nepticulidae
E. grandis	*Nepticula* sp. No. 1	Lepidoptera	Nepticulidae
E. grandis	?	Lepidoptera	Heliozelidae
E. gummifera	*Parectopa ida*	Lepidoptera	Gracilariidae
	Heliozela prodela	Lepidoptera	Heliozelidae
E. maculata	*Phylacteophaga froggatti*	Hymenoptera	Tenthredinidae
E. microcorys	*Nepticula* sp. (*funeralis* group)	Lepidoptera	Nepticulidae
	Nepticula sp. No. 4	Lepidoptera	Nepticulidae
	?	Lepidoptera	Nepticulidae
E. paniculata	*Parectopa ida*	Lepidoptera	Gracilariidae
E. pilularis	*Acrocercops laciniella*	Lepidoptera	Gracilariidae
	Parectopa ida	Lepidoptera	Gracilariidae
	Nepticula funeralis ?	Lepidoptera	Nepticulidae
	Nepticula sp. No. 2	Lepidoptera	Nepticulidae
	Nepticula sp. No. 3	Lepidoptera	Nepticulidae
	Nepticula sp. No. 4	Lepidoptera	Nepticulidae
	Nepticula sp. No. 5	Lepidoptera	Nepticulidae
	Heliozela prodela	Lepidoptera	Heliozelidae
	?	Lepidoptera	Heliozelidae
	"Tinea" sp. nr. *spodina*	Lepidoptera	Incurvariidae
	"Tinea" nectarea	Lepidoptera	Tineidae
E. radiata	*Acrocercops* sp. nov ?	Lepidoptera	Gracilariidae
E. robusta	*Phylacteophaga froggatti*	Hymenoptera	Tenthredinidae
	Parectopa ida	Lepidoptera	Gracilariidae
E. saligna	*Phylacteophaga froggatti* var.	Hymenoptera	Tenthredinidae
	Acrocercops hoplocala	Lepidoptera	Gracilariidae
	A. laciniella	Lepidoptera	Gracilariidae
	Parectopa ida	Lepidoptera	Gracilariidae
	Nepticula sp. (*funeralis* group)	Lepidoptera	Nepticulidae
	Nepticula sp. No. 1	Lepidoptera	Nepticulidae
	Nepticula sp. No. 2	Lepidoptera	Nepticulidae
	Nepticula sp. No. 3	Lepidoptera	Nepticulidae
	Nepticula sp. No. 4	Lepidoptera	Nepticulidae
	?	Lepidoptera	Nepticulidae
	Heliozela prodela	Lepidoptera	Heliozelidae
	?	Lepidoptera	Heliozelidae
	"Tinea" in *spodina* group	Lepidoptera	Incurvariidae
	"Tinea" nr. *spodina*	Lepidoptera	Incurvariidae
	"Tinea" nectarea	Lepidoptera	Tineidae
	Eupselia nr. *carpocapsella*	Lepidoptera	Glyphipterygidae
E. sideroxylon	*Phylacteophaga froggatti*	Hymenoptera	Tenthredinidae
E. sieberi	*"Tinea"* nr. *pentaspila*	Lepidoptera	Incurvariidae
E. stricta	?	Lepidoptera	Heliozelidae
Euodia micrococca	*Acrocercops macaria*	Lepidoptera	Gracilariidae
Eustephus sp.	*Melanagromyza dianellae*	Diptera	Agromyzidae
Gahnia melanocarpa	?	Lepidoptera	Cosmopterygidae

Glochidion ferdinandi	*Gracilaria xanthopharella*	Lepidoptera	Gracilariidae
	Nepticula phyllanthina	Lepidoptera	Nepticulidae
Glycine sp.	*Melanagromyza sojae*	Diptera	Agromyzidae
G. soja	*M. centrosematis*	Diptera	Agromyzidae
Goodenia ovata	*Ophiomyia goodeniae*	Diptera	Agromyzidae
GRAMINEAE	*Pseudonapomyza spicata*	Diptera	Agromyzidae
Grevillea robusta	*Peraglyphis atimana*	Lepidoptera	Tortricidae
Gynandropsis speciosa	*Liriomyza brassicae*	Diptera	Agromyzidae
Hakea salicifolia	*Acrocercops* nr. *argyrodesma*	Lepidoptera	Gracilariidae
H. sericea	*Cydmaea eucalypti*	Coleoptera	Curculionidae
H. teretifolia	*C. diversa*	Coleoptera	Curculionidae
	C. luctuosa	Coleoptera	Curculionidae
Helichrysum bracteatum	*Lirionyza helichrysi*	Diptera	Agromyzidae
H. dendroideum	?	Diptera	Agromyzidae
H. rutidolepis	*Phytomyza atricornis*	Diptera	Agromyzidae
Hibbertia scandens	*Phyllocnistis* sp. nov. ?	Lepidoptera	Gracilariidae
Hydrangea macrophylla	*Melanagromyza atomella*	Diptera	Agromyzidae
Indigophera australis	*M. indigopherae*	Diptera	Agromyzidae
I. suffruticosa	*M. indigopherae*	Diptera	Agromyzidae
Juncus sp. ?	*Phytobia triplicata*	Diptera	Agromyzidae
Lantana camara	*Ophiomyia lantanae*	Diptera	Agromyzidae
LEGUMINOSAE	*Melanagromyza sojae*	Diptera	Agromyzidae
Lomandra longifolia	*Ephiphthora* sp.	Lepidoptera	Gelechiidae
Lycopersicon esculentum	*Gnoremoschema phaesiosema*	Lepidoptera	Gelechiidae
Macadamia integrifolia ?	*Acrocercops chionosema*	Lepidoptera	Gracilariidae
Marsdenia rostrata	*Melanagromyza atomella*	Diptera	Agromyzidae
Murraya paniculata	*M. murrayae*	Diptera	Agromyzidae
Oplismenus compositus	*Agromyza* sp. ?	Diptera	Agromyzidae
Passiflora suberosa	*Melanagromyza atomella*	Diptera	Agromyzidae
Phaseolus sp.	*M. sojae*	Diptera	Agromyzidae
P. lathyroides	*M. phaseoli*	Diptera	Agromyzidae
Pimelea ligustrina	*M. wilkstroemiae*	Diptera	Agromyzidae
Pisum sativum	*M. pisi*	Diptera	Agromyzidae
Plantago sp.	*Phytomyza plantaginis*	Diptera	Agromyzidae
Platycerium grande	*Halticorcus platycerii*	Coleoptera	Chrysomelidae
Pomaderris ligustrina	*Acrocercops* sp.	Lepidoptera	Gracilariidae
	Nepticula sp.	Lepidoptera	Nepticulidae
Portulaca oleracea	*Schizocerella pilicornis*	Hymenoptera	Argidae
Raphanus raphanistrum	*Liriomyza brassicae*	Diptera	Agromyzidae
Rubus moorei	*Nepticula* sp. ?	Lepidoptera	Nepticulidae
Senecio sp.	?	Diptera	Agromyzidae
S. dryadeus	*Phytomyza atricornis*	Diptera	Agromyzidae
S. lautus	*Phytomyza atricornis*	Diptera	Agromyzidae
S. linearifolius	*Phytomyza atricornis*	Diptera	Agromyzidae
S. minimus	*Phytomyza atricornis*	Diptera	Agromyzidae
S. pterophorus	*Phytomyza atricornis*	Diptera	Agromyzidae
S. pterophorus	? *Melanagromyza* sp.	Diptera	Agromyzidae
S. vagus	*Melanagromyza seneciophila*	Diptera	Agromyzidae
Soja sp.	*M. phaseoli*	Diptera	Agromyzidae
Solanum prinophyllum	*Ophiomyia solanicola*	Diptera	Agromyzidae
S. tuberosum	*Gnoremoschema operculella*	Lepidoptera	Gelechiidae
Sonchus oleraceus	*Phytomyza atricornis*	Diptera	Agromyzidae
Spinacia oleracea	*Liriomyza chenopodii*	Diptera	Agromyzidae
Stellaris media	*Liriomyza chenopodii*	Diptera	Agromyzidae
Swainsona galegifolia	*Melanagromyza sojae*	Diptera	Agromyzidae
Tropaeolum major	*Liriomyza brassicae*	Diptera	Agromyzidae
Tylophora barbata	*M. atomella*	Diptera	Agromyzidae
Viena sp.	*M. phaseoli*	Diptera	Agromyzidae
Wilkstroemia indica	*M. wilkstroemiae*	Diptera	Agromyzidae
Zea sp.	*Pseudonapomyza spicata*	Diptera	Agromyzidae

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